Air Traffic Control Seminar

Current ATC Operations: Air Route Traffic Control Center (ARTCC)

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Oakland ARTCC

NASA Ames Research Center

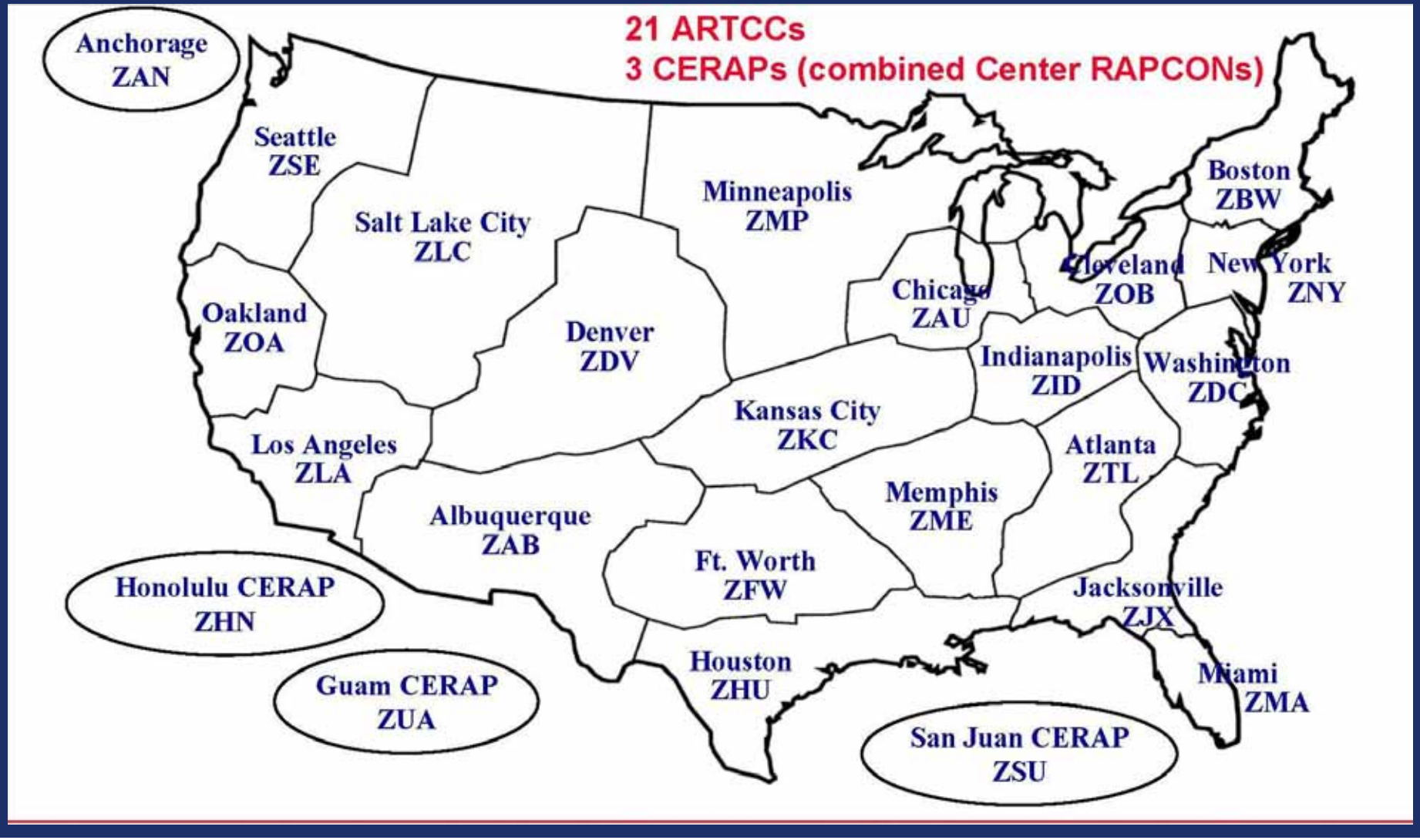
Moffett Field, California

July 5-6, 2006

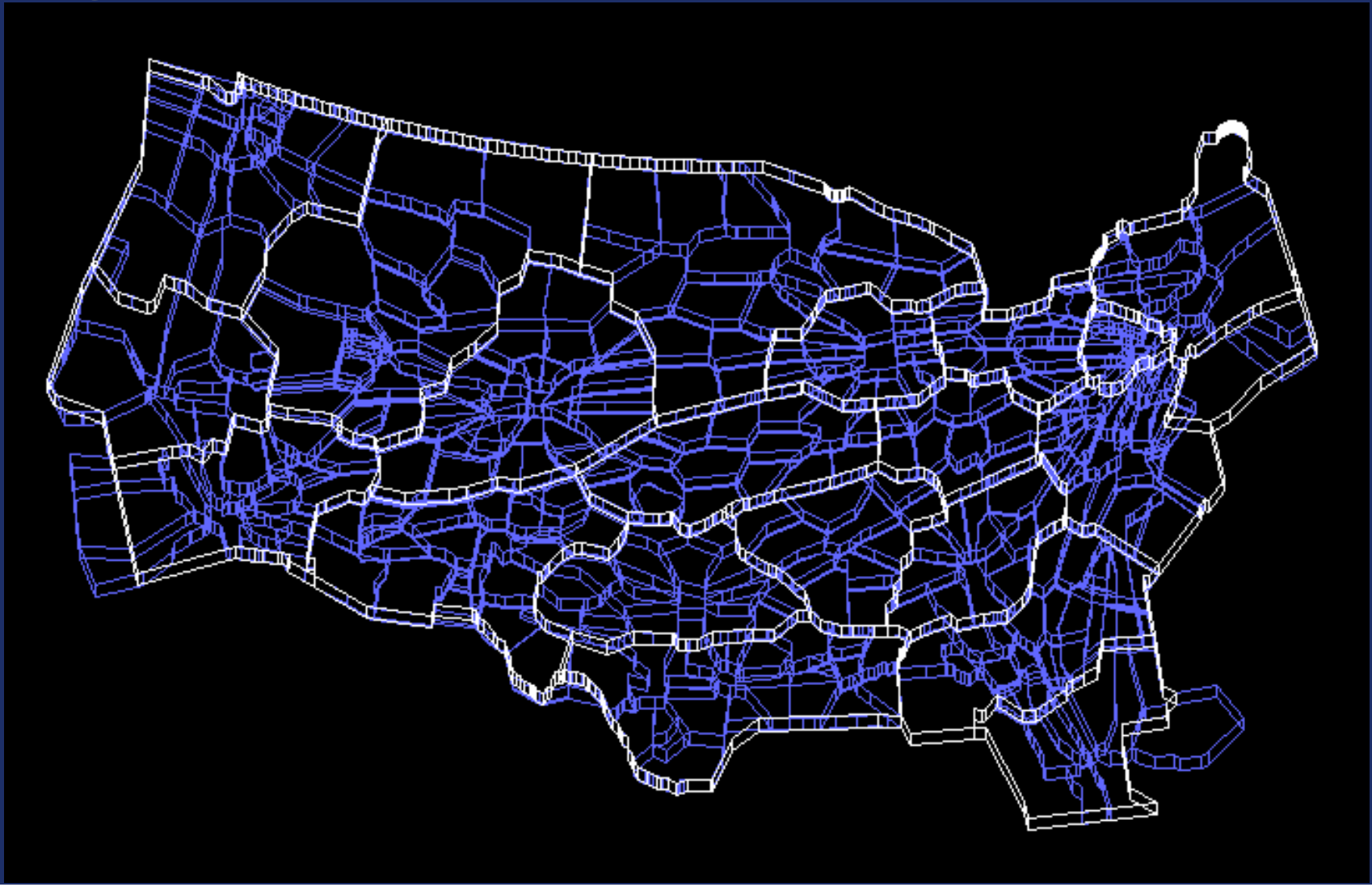
Movie on MASE (Airspace Redesign)

- **Click to show movie**

Air Route Traffic Control Centers



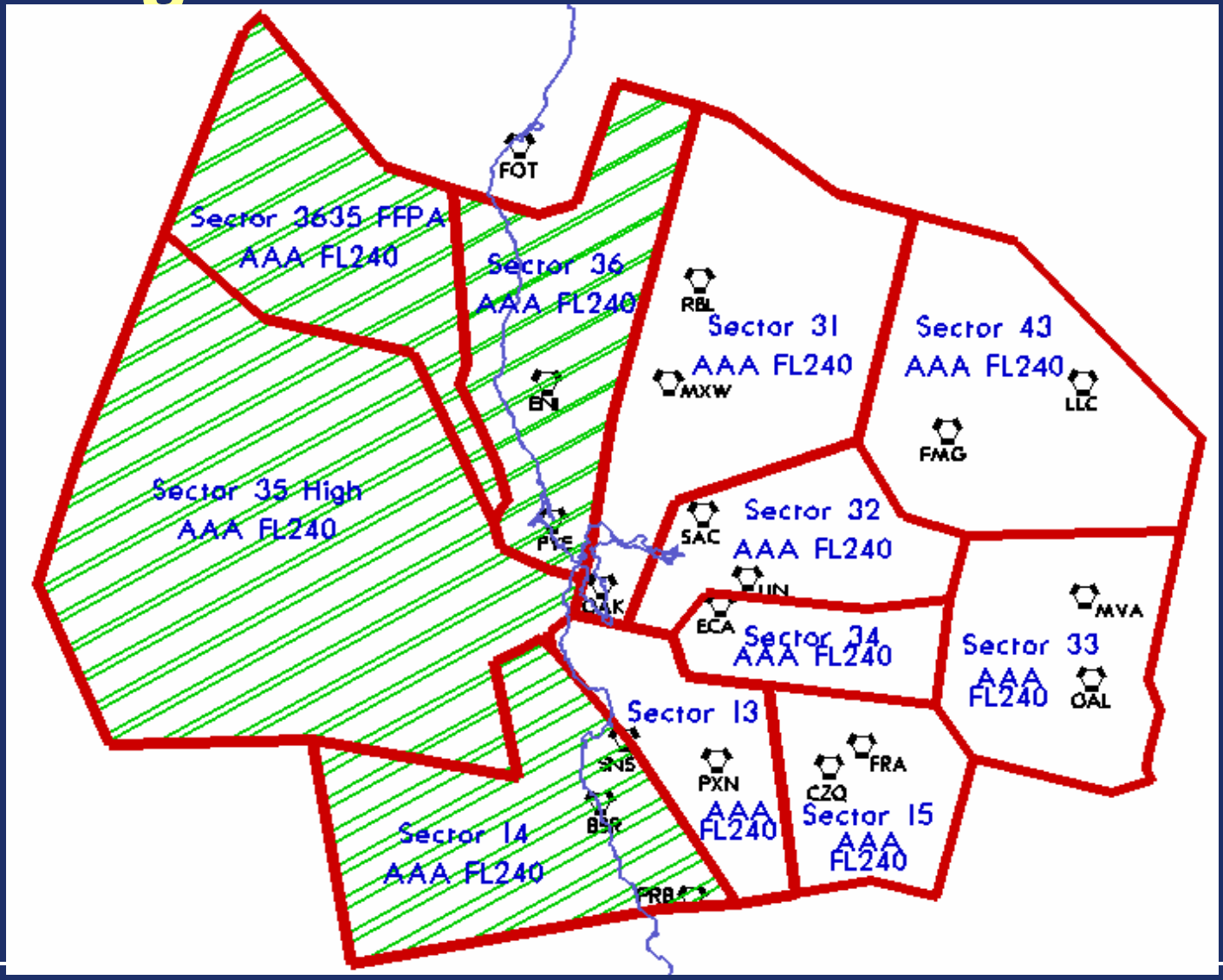
High Altitude Enroute Sectors



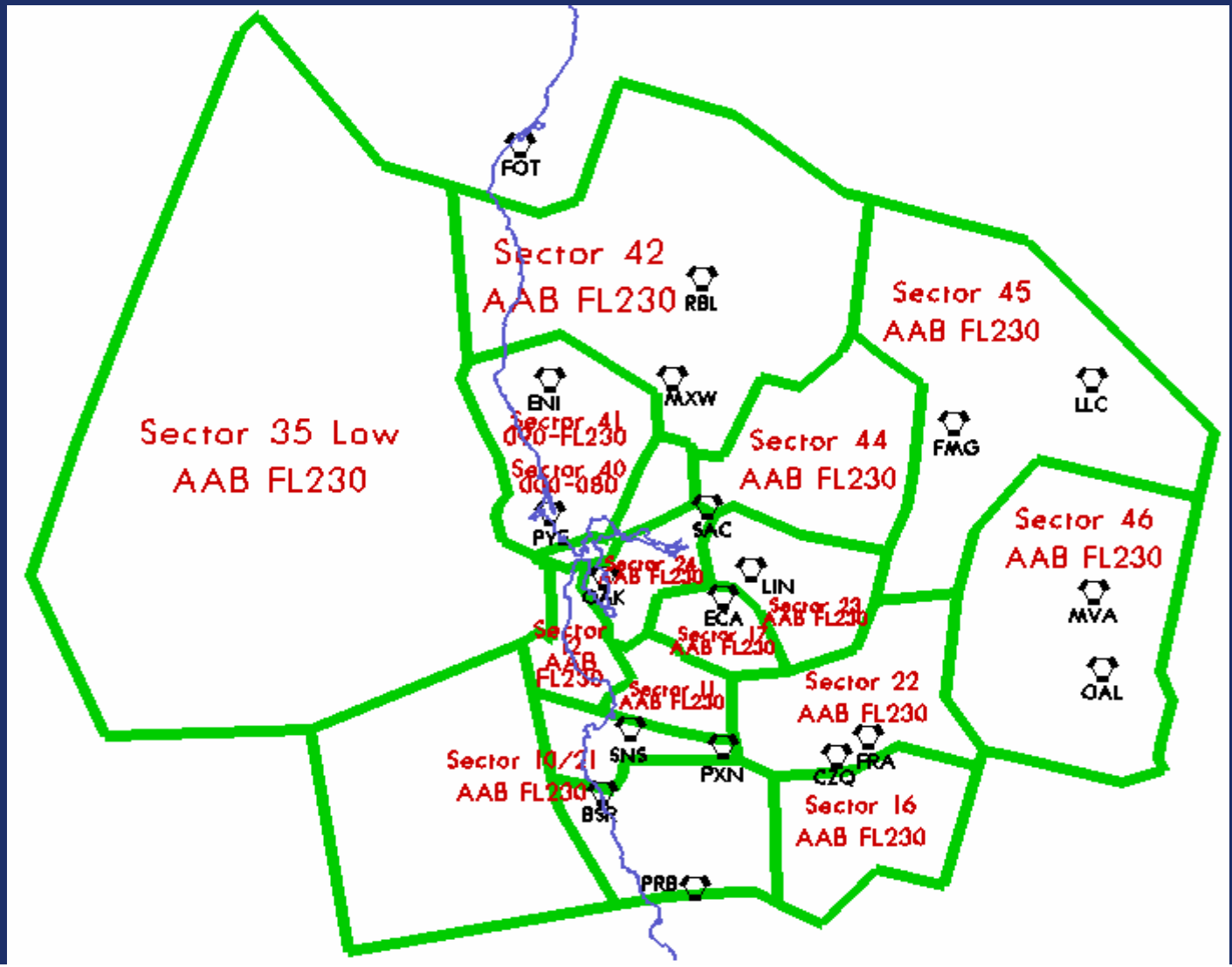
Oakland ARTCC Facility Operations

- **Domestic Control Room**
  - 3 Areas of Specialization
  - 7 High Altitude and 14 Low Altitude Sectors
  - Traffic management complex
  - National Airspace System Operations Manager (NOM) complex
  - Center Weather Service Unit (CWSU)
- **ATOP Control Room**
  - 2 oceanic areas of specialization
  - 8 Oceanic Sectors and 2 Coastal High Altitude Radar Sectors

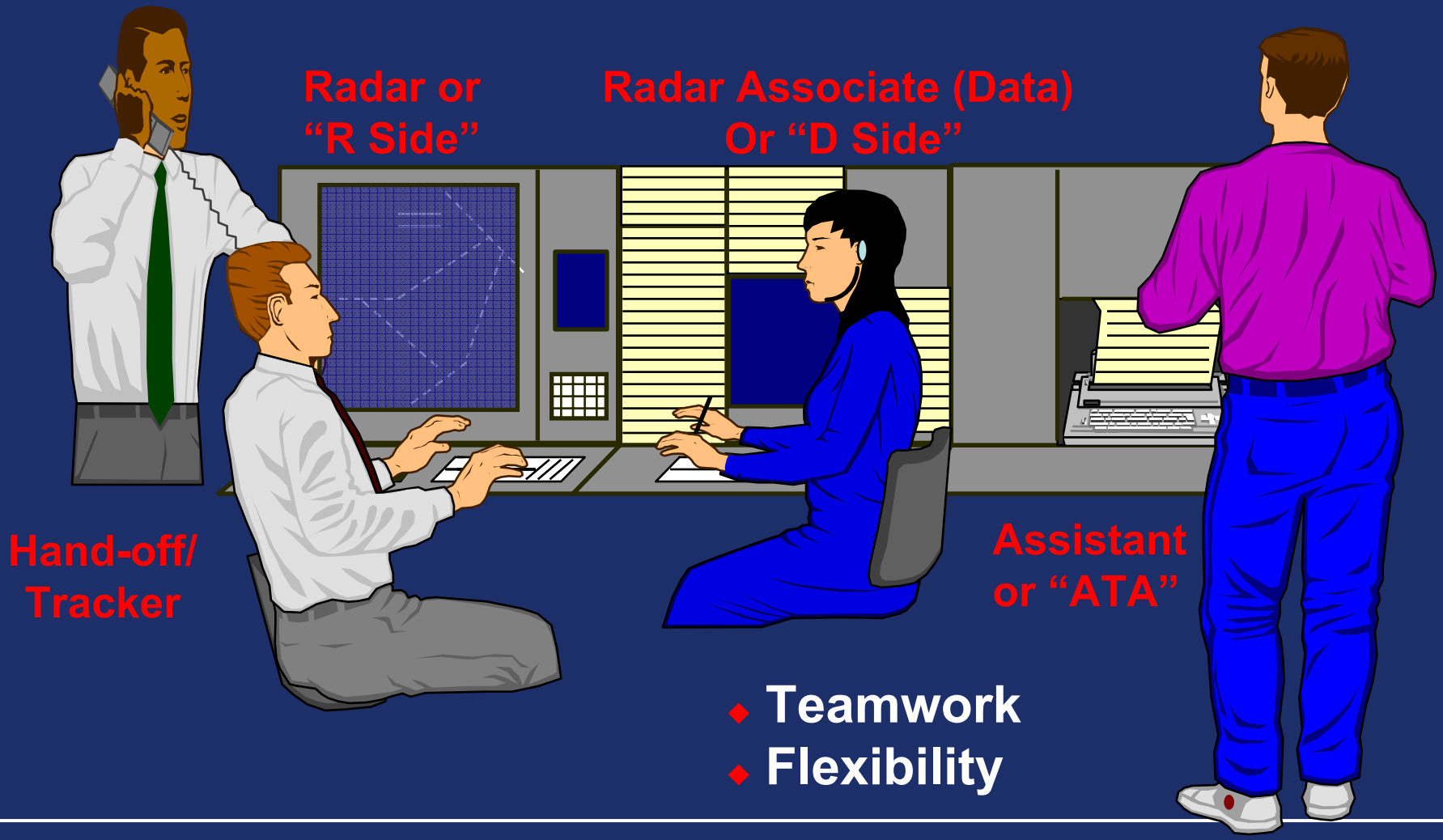
ZOA High Altitude Sectorization



ZOA Low Altitude Sectorization



ARTCC ATC Positions



- Teamwork
- Flexibility

En Route Sector Controller Roles

- **R-side (Radar controller) - provides separation between all IFR flights in the sector; communicates directly with pilots; during light traffic works the sector alone also performing D-side duties**
- **D-side – (Radar associate controller – data): handles flight strips data and URET; detects potential traffic conflicts; coordinates with other sectors; supports R-side controller**
- **ATA – (Assistant) delivers flight strips to sectors**
- **Tracker – third controller at the sector during heavy traffic periods; detects conflicts; coordinates with other sectors**
- **Supervisor – manages controllers, trainees, equipment and other resources in the area of specialization**

Enroute Training

- **FAA Academy (Oklahoma City) - 11 weeks**
  - Fundamentals of aviation and ATC
  - Classroom and simulation labs
- **Field Facility – typically 3 years to CPC**
  - Classroom (local airspace and procedures) –10 weeks
  - Assistant controller assignment
  - Radar Associate Training – 50 weeks
    - Simulation lab (DYSIM) -
    - On the Job Training (OJT)

Training (cont'd)

- **Field Facility (cont'd)**
  - Radar training – 100 weeks
    - Simulation lab (DYSIM)
    - On the Job Training (OJT)
- **Typical progression: An enroute controller spends 3 years from the start of academy training to complete all ATC training (certified professional controller – CPC). During this period, trainees are used, at times for operational staffing on positions for which they have been certified.**

Surveillance Systems (En Route)

- The Air Route Surveillance Radar (ARSR) is a long-range radar system designed to provide a display of aircraft over large areas controlled by Air Route Traffic Control Centers.
- Each ARSR site can monitor aircraft flying within a 200-mile radius of the antenna, although some stations can monitor aircraft as far away as 600 miles.
- ARSR antenna rotate at 5rpm providing sweeps at 12 second intervals.
- Data from multiple ARSR sites is presented on controller displays in a mosaic, providing radar coverage over a large geographic area.
- There are approximately 100 ARSR sites in the US.

Display System Replacement (DSR) Console

Radar Target Symbols

(Radar updates every 12 seconds)

Primary Target

Coast Track

Secondary (Beacon) Targets:

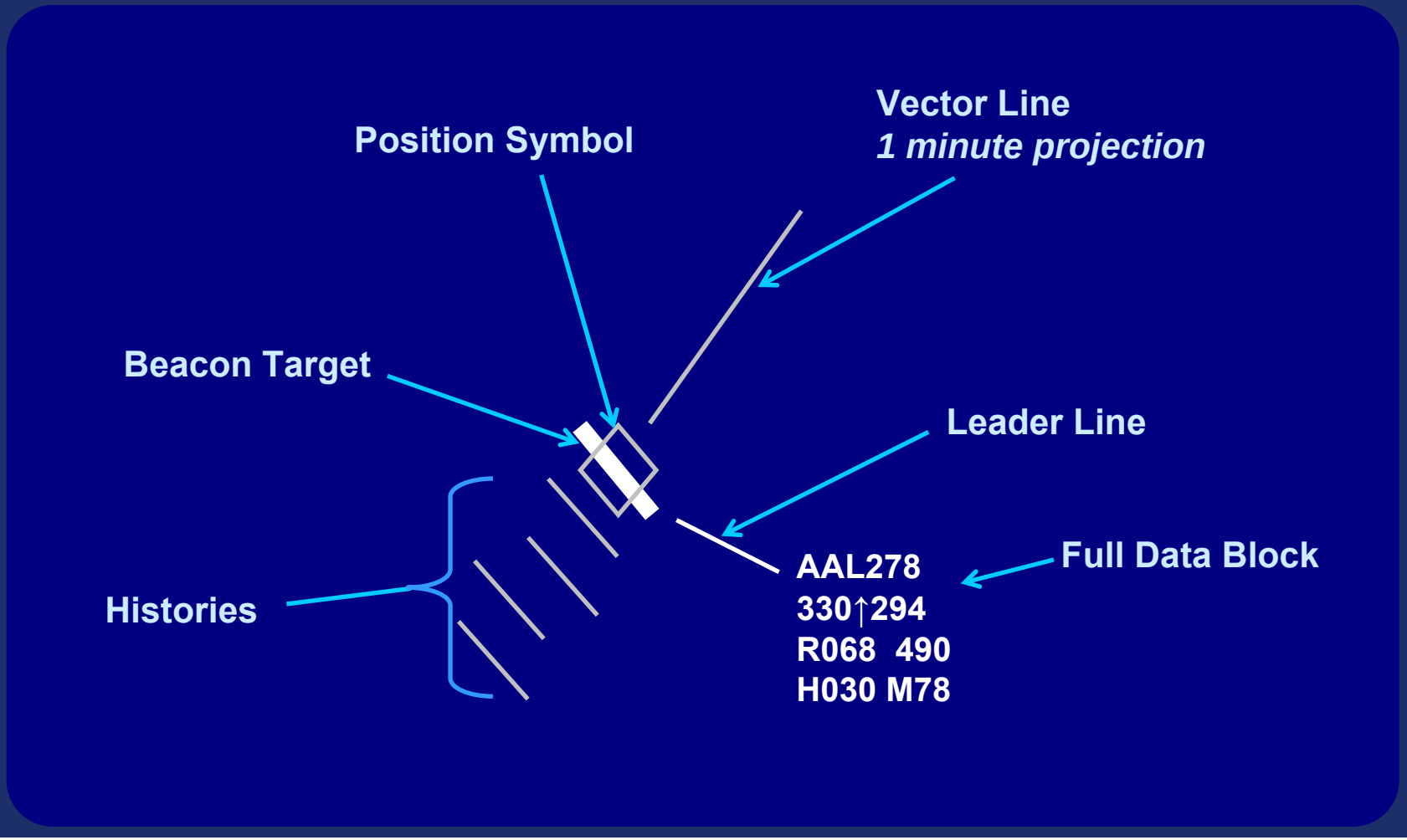
Uncorrelated Beacon

Flat Track

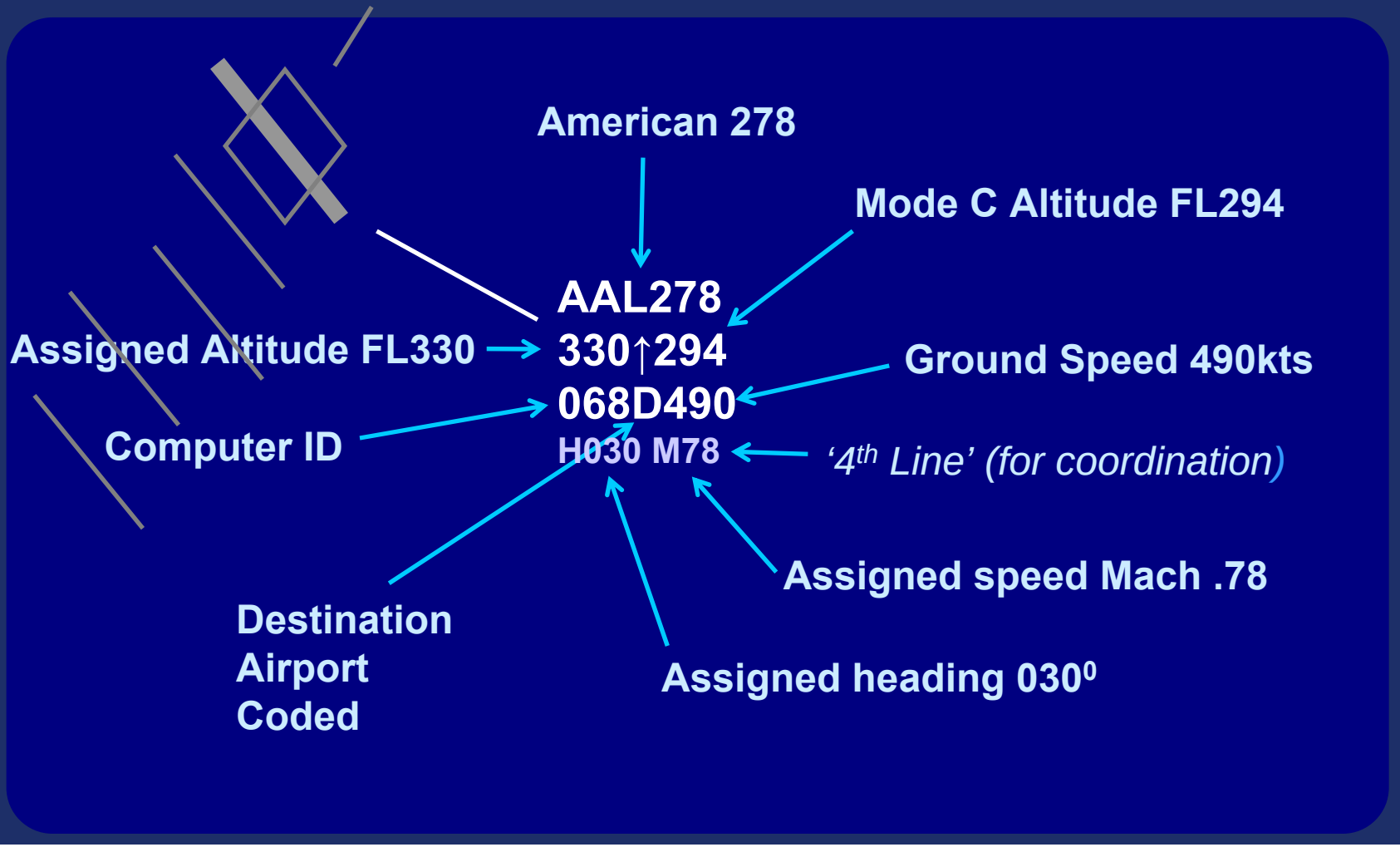
Correlated Beacon

Free Track

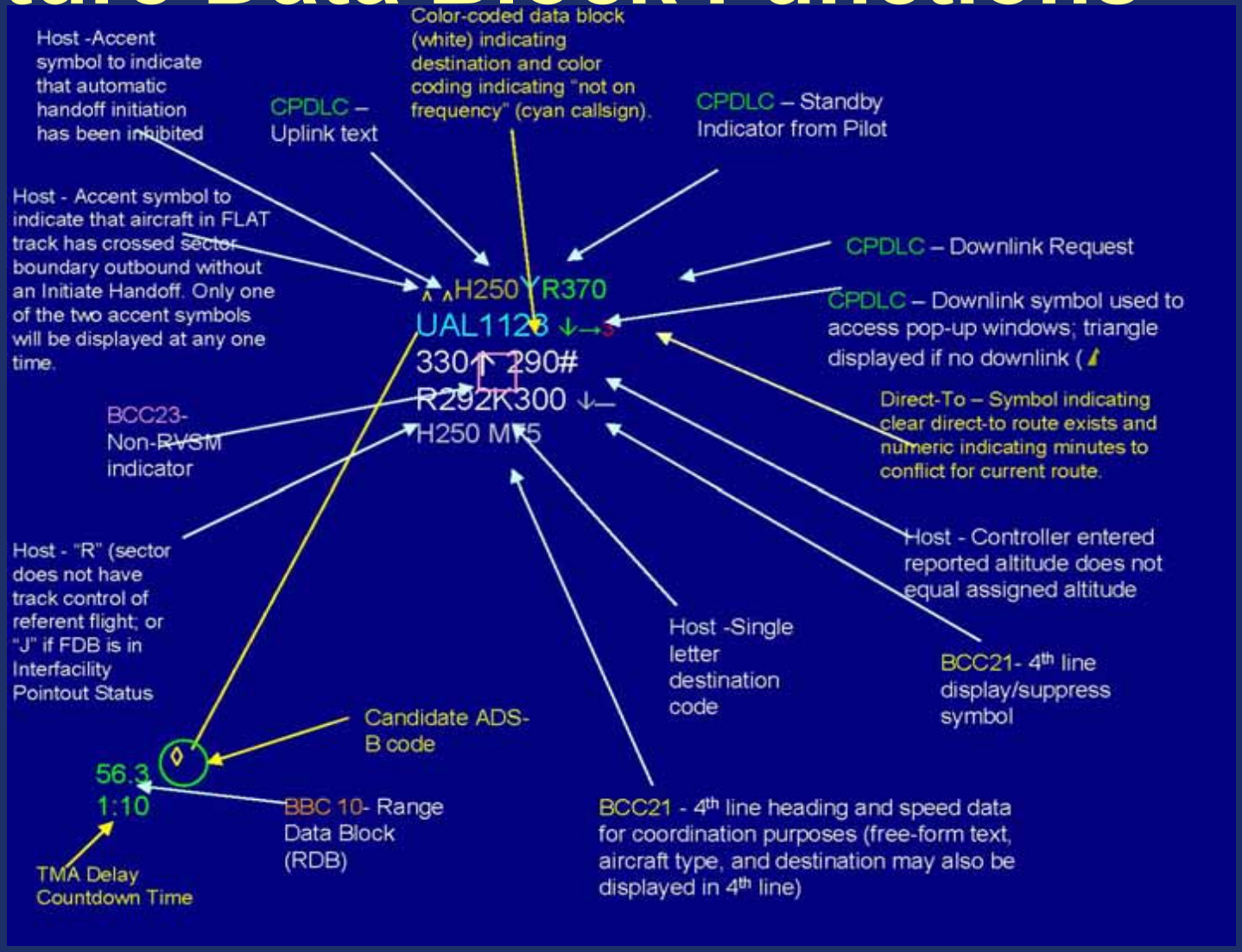
En Route Radar Target Display



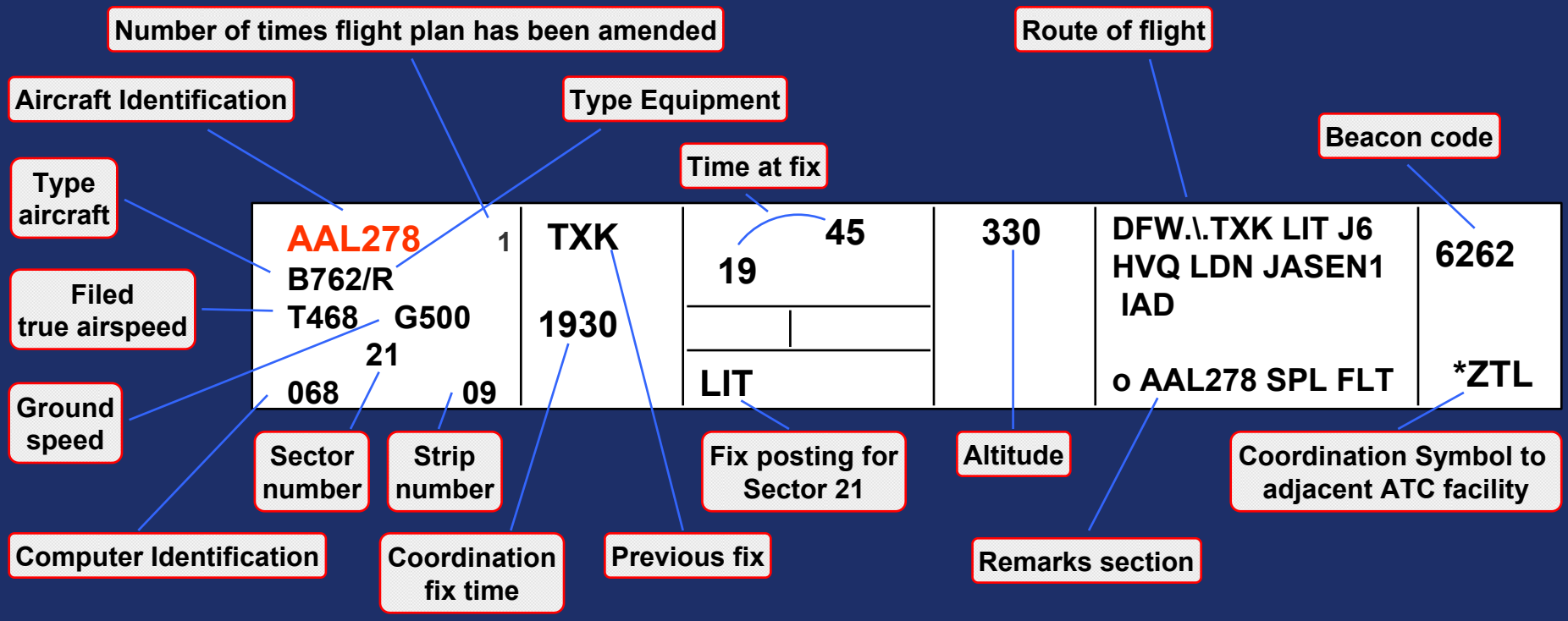
En Route Full Data Block



Future Data Block Functions



Flight Progress Strips



- Control Symbology
- Red/Black Strip Marking

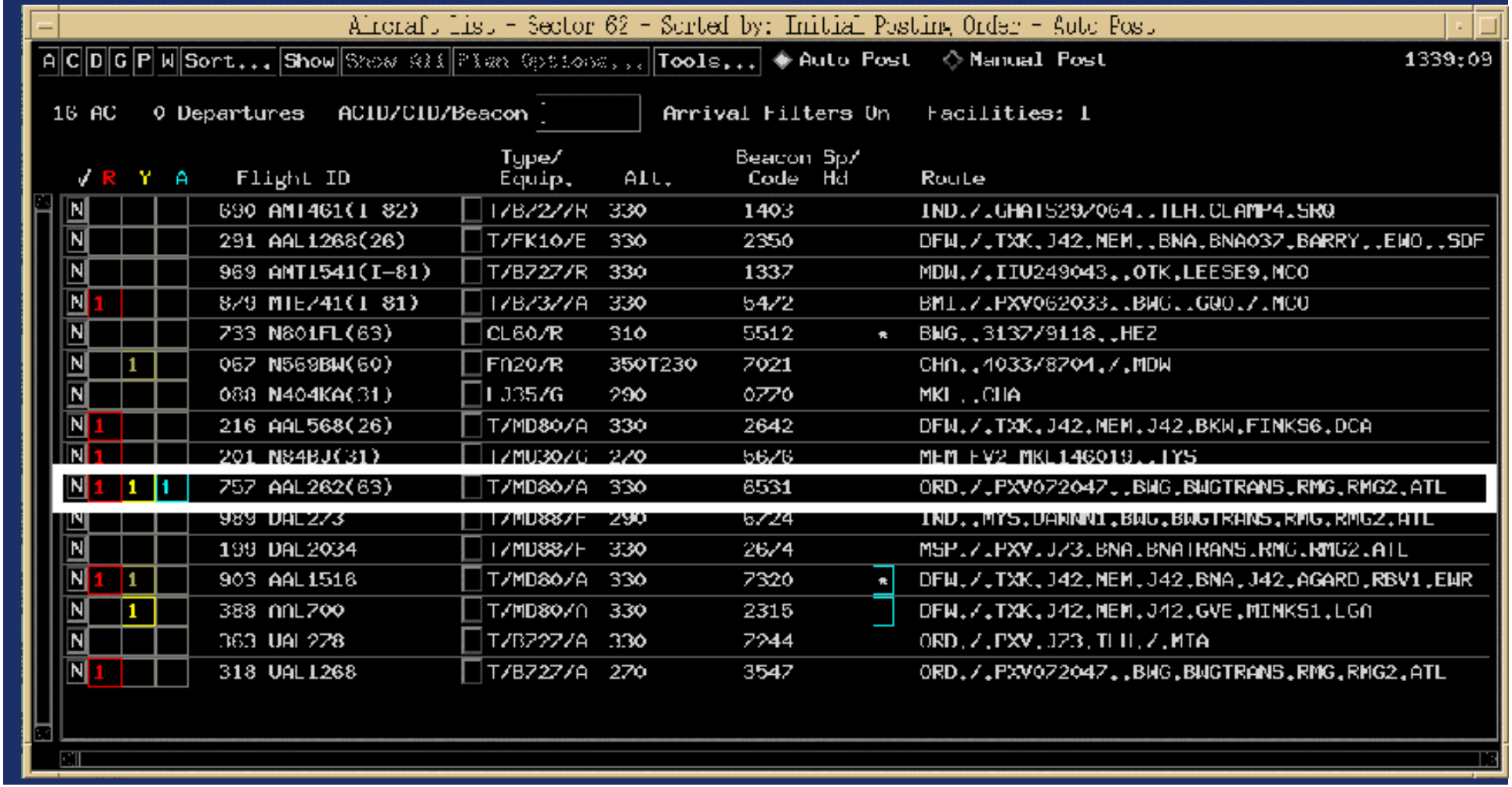
15 Day Records Retention

- **All information presented to controllers is recorded and retained for 15 days**
- **Data retained includes:**
  - Radar data
  - Computer display data
  - Air-to-ground communications (voice, datalink)
  - VSCS (Voice Switching and Communications System) – ground-to-ground communications
  - Flight progress strips

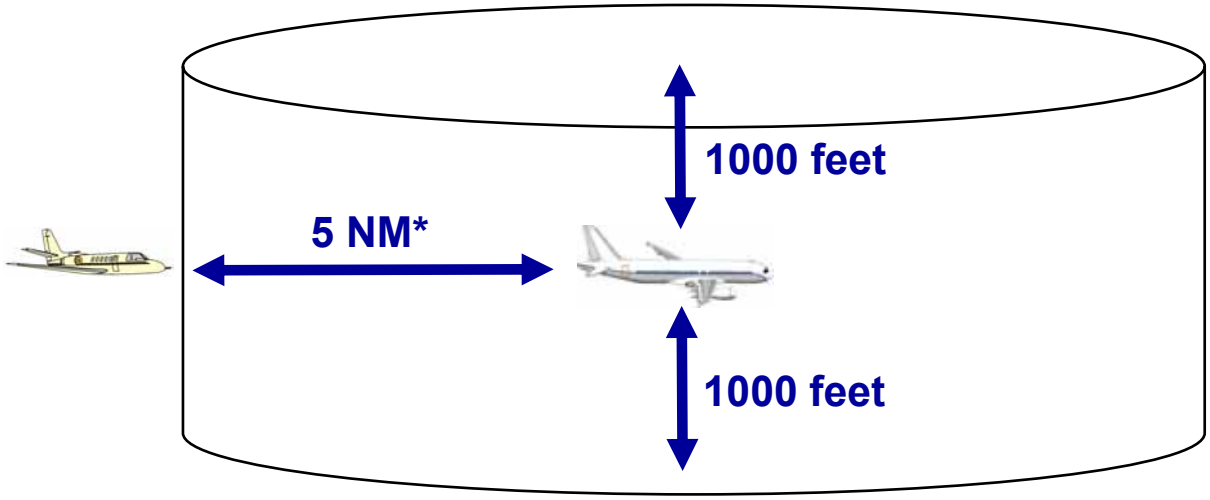
URET Panel
(User Request Evaluation Tool)

- At D-side position
- Provides electronic flight strip data
- Provides conflict detection (separate from DSR conflict alert system)
- Includes trial planner function – checks that clearances issued are conflict-free

URET Panel
(User Request Evaluation Tool)



En Route Radar Separation



* 3NM when within 40NM or more from antenna or when using single (non-mosaic) radar data source.

Ref: FAAO 7110.65, 5-5-4 Radar Minima

Vertical Separation

- **Standard – 1000’ up to FL290**
  - 2000’ at or above FL290
  - 5000’ at or above FL600
- **Reduced Vertical Separation Minima (RVSM)**
  - 1000’ from FL290 to FL 410
  - First introduced over Oceanic Airspace
  - Introduced over Domestic US (and internationally) on 1/20/05 (DRVSM)
  - Cruise operation within D/RVSM airspace requires specific avionics (more accurate altimetry and collision avoidance system), plus pilot training
  - ATC can grant exceptions to these requirements for transit through RVSM airspace to higher/lower altitudes.

Non-Radar Separation
(Domestic En Route Sectors)

- In areas of insufficient radar coverage, 'manual' separation rules apply for airport departures/arrivals and enroute flights.
- DME separation example: with slower speed aircraft behind, use pilot reported positions from DME (Distance Measurement Equipment) readings:

FIG 6–4–11

Minima for Same Course Separation

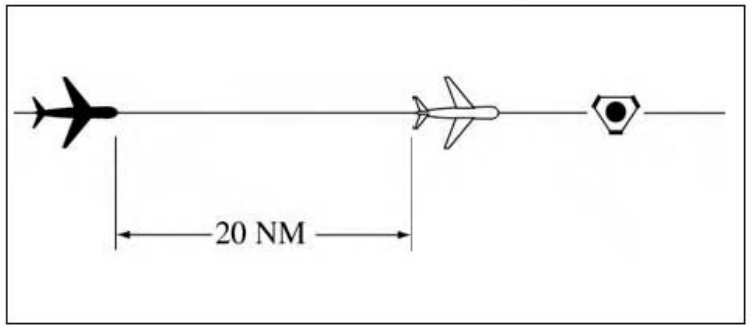
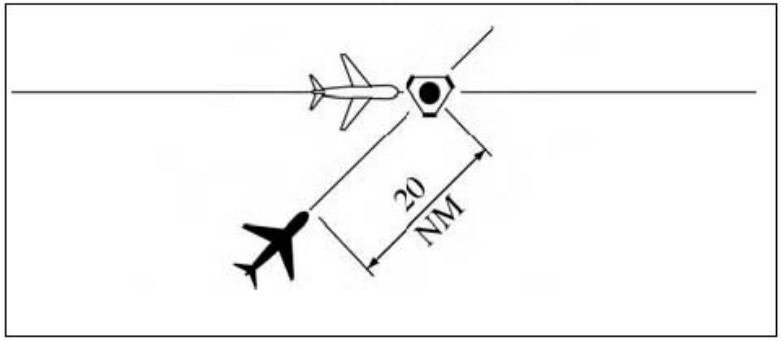


FIG 6–4–12

Minima for Crossing Courses Separation



Non-Radar Separation
(Domestic En Route Sectors)

- **Time based separation example: with same or slower speed aircraft behind, use pilot reported time over fix**

FIG 6–4–13

Minima for Same Course Separation

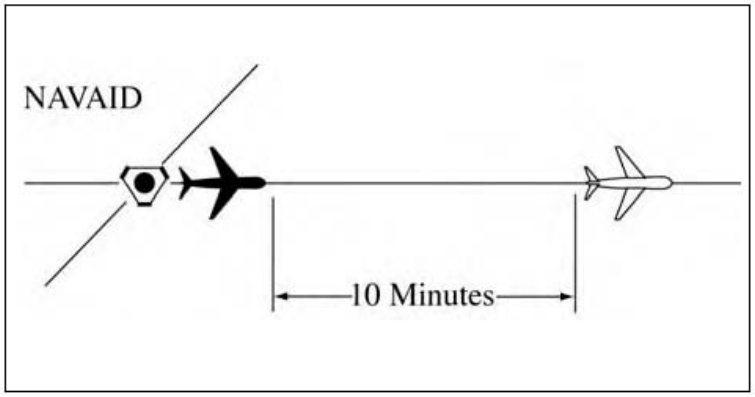
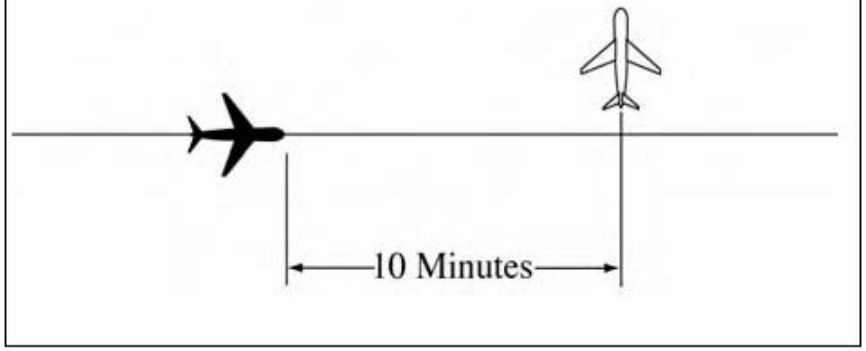


FIG 6–4–14

Minima for Crossing Courses Separation



En Route Radar Separation - Airspace

- Flights must be separated from other sectors and Special Use Airspace.

  En route Stage A/DARC or Stage A/EDARC:

  (a) Below Flight Level 600– 2 1/2 miles.

  (b) Flight Level 600 and above– 5 miles.

Special Use Airspace

- Alert Area
- Air Traffic Control
- Assigned Airspace
- Controlled Firing Area
- Military Operating Areas
- Prohibited Area
- Restricted Area
- Warning Area

Conflict Alert - DSR

- Tactical conflict prediction
- Alerts controller to potential loss of standard separation 3 minutes ahead
- Both aircraft data blocks flash (brighten then normal intensity)

Conflict Probe - URET

- Strategic conflict prediction
- Projects loss of standard separation up to 20 minutes ahead
- URET display and data blocks are highlighted to indicate potential conflict

Radar Handoff / Communications Transfer

- No aircraft can enter another controller's airspace without that controller's permission. That permission being automation or verbal coordination.
  - Letters of Agreement
  - Automated Information Transfer

Oakland Center Evolution

Oakland Center will evolve from a 2-tier high/low sector airspace configuration to a 3-tier high/mid/low sector configuration.